

Article

Agricultural Heritage Landscapes of Greece: Three Case Studies and Strategic Steps towards Their Acknowledgement, Conservation and Management

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Abstract: United Nation Sustainable Development Goals (SDGs), the European Green Deal and the new Common Agricultural Policy (CAP) are legislative proposals counting on rural and agricultural landscapes to assist climate change mitigation, ecosystem services and preservation of heritage. Agricultural landscapes take up more than 10% of the earth's land surface (1.5 billion ha), presenting a continuous field of interaction between man and nature, shaping the earth's epidermis since antiquity. The Mediterranean basin is one of the most evident places on earth exhibiting this relationship, between the anthropogenic and the natural, hosting lands of enormous ecological, economic and cultural value. With Greece's economy being based largely on agriculture in the past, traditional Greek agricultural landscapes present great socio-cultural importance; those landscapes, managed appropriately, could dynamically help combat climate issues, continue to provide services of high value and also present local character, tradition and culture. Yet, the acknowledgement of agricultural heritage, the creation of mixed productive socio-ecological profiles and the realization of governance schemes towards agricultural connections, such as linking traditional agricultural practices to the wider anthropogenic, ecological and recreational services, are in their infancy for many countries worldwide, including Greece. Landscape heritage is considered as important as archaeological and architectural heritage. In this paper, three examples of high importance Agricultural Heritage Landscapes (AHLs) are presented: the masticulture in Chios island; the black (Corinthian) raisin vineyards in Aigialeia (Egialia), Peloponnese; and the olive groves of Thassos island. Their importance is analyzed and strategic steps towards their acknowledgement, conservation and appropriate management are presented.

Keywords: agricultural landscapes; agricultural heritage; agricultural heritage landscapes (AHLs); cultural heritage; Greece



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1. Introduction

Agricultural landscapes take up more than 10% of the earth's land surface (1.5 billion ha), presenting a continuous field of interaction between man and nature, shaping the earth's epidermis since antiquity. The practice of agriculture was born in that fundamental moment in time when humans managed to step away from being nomadic collectors and became permanent cultivators and producers of their food, and it is this 'agricultural revolution' that completely transformed human societies [1]. There were 10.3 million farms in the EU in 2016 and 22 million workers, with two-thirds of the plots being less than 5 hectares in size [2], depicting a variant mosaic of heterogeneity. Over centuries, agricultural practice and science have altered the earth's surface by soil, air, temperature, and plant

manipulation, creating a pool of genetic biodiversity and molding a heterogeneous land mosaic with various semi-natural habitats like meadows, pastures, field margins, forest patches, agro-forestry systems, and so on [3]. Varying from arable cropland to orchard, fruit and olive groves, to rice fields and perennial horticultural produce, agriculture's spatial footprint creates a multi-pattern land that in several cases can also present great ecological, economic, aesthetic, cultural and recreational value. The supplying and ecological power of agricultural landscapes is a fact. They are valued by humans for their designed-to-provide services, such as food, forage, fiber, bioenergy and pharmaceuticals. Furthermore, these highly managed systems also support genetic biodiversity, soil formation and structure, soil fertility, nutrient cycling, provision and purification of water [4], although the same things can also be considered as 'disservices' in high maintenance mono-agricultural systems. Disservices from agriculture also include loss of wildlife habitat, loss of biodiversity, pesticide poisoning of humans and non-target species and greenhouse emissions [5]. For some, agricultural systems are considered an "anathema to conservation", as stated by Power (2010) [4], yet all carefully managed agricultural systems can largely maintain regulating services such as flood control, carbon storage, climate regulation, waste management and others.

The 17 Sustainable Development Goals (SDGs) of the United Nations via the 2030 Agenda for Sustainable Development adopted in 2015 [6] link agricultural landscapes with sustainability. Sustainable agriculture is mentioned directly in Goal 2, with a will to support small-scale food producers and particularly women, indigenous people, family farmers, pastoralists and fishers to implement resilient agricultural practices of increasing productivity and production that also maintain ecosystems, the genetic diversity of seeds, plants, animals and their related wild species, and strengthen overall the capacity of humanity for adaptation to climate change. Dating back to 1962, the Common Agricultural Policy (CAP) presents itself as a partnership between agriculture and society and between Europe and its farmers [7]. The CAP sets high ambitions, not only on securing a fair deal and worthy economic future for farmers, but also on safeguarding agriculture's position at the heart of Europe's society, and also increasing ambitions for environmental and climate action. The CAP also cleverly focuses on the enhancement and boosting of the rural landscapes that farmers live in, act on and shape; local development of rural areas include bio-economy, sustainable forestry and eco schemes. Many of the agricultural landscapes are habitats belonging to the Natura 2000 network (11% of utilized agricultural area and 23% of forest land in the EU are designated as Natura 2000 zones; farmland and forest land together make up more than 70% of the Natura 2000 network) and support species that are often protected by the Habitats Directive and Birds Directive [3]. A precondition for more biodiversity on farmland is the creation of habitats in the form of landscape elements like hedges, trees, ponds and field margins and typology like short-rotation coppice, fallow land and agroforestry systems. Maintaining wildlife corridors, 'wildlife-friendly areas', the 'current state' of agricultural landscapes and landscape 'friendly management' are also very important. Furthermore, sensitive agricultural landscapes like wetlands and peatlands ought to be protected since they are carbon-rich soils, essential for the maintenance of permanent grassland [8].

According to the European Landscape Convention of the Council of Europe [9], "Landscape is an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors". Perceived initially as physical space on the earth epidermis, yet with mental and cognitive attachments to the past, present, and future of spatiotemporal characters, and inextricably related to memory. Memory recall and spatiotemporal cognitive attachments create mental values that are interpreted as cultural heritage. According to the ICCROM Working Group 'Heritage and Society' (2005), "Cultural Heritage is an expression of the ways of living developed by a community and passed on from generation to generation, including customs, practices, places, objects, artistic expressions and values" [10]. Yet, despite the need for incorporation of the word 'landscape' in official documents, the problem remains. The word 'landscape' is not men-

tioned once in the UN's SDGs; thankfully, it is mentioned as a major goal in the new CAP. Highlighting the need for the inclusion of landscape in sectoral policies, the Lausanne Declaration on "Landscape integration in sectoral policies" was taken with interest by the Steering Committee for Culture, Heritage and Landscape of the Council of Europe. Lausanne's Declaration sees "Landscape's structural role as a lever for sustainable development based on a harmonious balance between the environmental, social, cultural, and economic dimensions; and the importance of the landscape with regard to the challenges of health, food and energy, as well as addressing the challenges resulting from climate change, the disappearance of living species, pollution of the water and air, degradation of agricultural and forest soils, and artificialization of land" [11].

Cultural landscapes are already a widely recognized issue within Europe, as indicated by the European Landscape Convention, and internationally, as supported by UNESCO's landscape criteria for the World Heritage List. According to the HEREIN network of the Council of Europe, 'landscape heritage' is as important as archaeological and architectural heritage. The network acts as an 'observatory tool', bringing together 42 member states responsible for national policies in the field of cultural heritage, supporting the implementation of European heritage conventions, the evolution of policies and the strengthening of the values of heritage for society as a factor of intercultural dialogue and improvement of living conditions [12]. Agricultural heritage systems are cultural landscapes, and as such, the approach to management is directly related to the value and characteristics of cultural landscapes. Similar to cultural and natural heritage sites, agricultural heritage systems also possess 'outstanding universal values' (OUV) [13], but somehow differ from conventional heritage sites, as they ought to evolve via dynamic conservation and adaptive management.

Identification of landscape character via Landscape Character Assessment (LCA) is a tool to measure landscapes, quantifiably and qualitatively, and assess and suggest actions related to specific goals. LCA is a two-stage process: (a) landscape characterization, via understanding and creation of landscape identity and landscape types, presented in plans of maps and characteristic photographs and (b) landscape assessment, leading to decisions concerning the management, planning, and protection of the landscape types [14]. Although holding a twofold perspective, subjective vs. objective [14], which leads to rather "not as much quantification and subjectiveness, as for it to be considered scientifically reliable", LCA continues to be used systematically in landscape planning and management campaigns and research.

Mitchell et al. (2009) [15] set three principles for a successful management framework on cultural landscapes: (a) placing people and dialogues among all stakeholders at the heart of successful management practice; (b) the interaction of stakeholders with the land as the focus of management; and (c) the attention to the wider landscape context. Furthermore, he identifies eight key stages for a successful management process: (a) getting agreement on the approach and planning the work; (b) understanding the cultural landscape and its values; (c) developing a shared vision for the future; (d) defining the management objectives and assessing opportunities and challenges—using management plans to organize and coordinate; (e) identifying options and agreeing on a management strategy; (f) coordinating the implementation of the management strategy; (g) monitoring, evaluation, and adaptive management and (h) deciding when to renew/revise the management strategies and the management plan.

If agricultural landscapes represent also cultural heritage, aesthetic beauty and recreational value, coupled with ecological power and economic prosperity, are there initiatives towards the acknowledgment of these characteristics?

One of the biggest initiatives on agricultural systems' value, global role, need of acknowledgment of protection, improved planning and management is GIAHS, or Globally Important Agricultural Heritage Systems, initiated in 2002 under FAO and defined as "outstanding landscapes of aesthetic beauty that combine agricultural biodiversity, resilient ecosystems and a valuable cultural heritage. Located in specific sites around the world, they sustainably provide multiple goods and services, food and livelihood security for millions of small-scale farmers".

There are sixty-two designated systems in twenty-two countries, and recently, fifteen new proposals from nine different countries were received [16]. The concept of agricultural heritage as expressed in GIAHS is quite different from ‘conventional heritage’ or ‘protected landscape’. “A GIAHS is a living, evolving system of human communities in an intricate relationship with their territory, cultural or agricultural landscape or biophysical and wider social environment” [16]. The GIAHS designation criteria focus on the ‘system’ and not the ‘produce’, setting humans at the heart of evolving spatio-temporal landscapes many centuries old, accumulating experience over and for generations, resilient to climate and other eco-challenges and socio-economic forces. Comparative studies on the conservation of agricultural heritage systems around the world [17–19] exhibit the advantage of the GIAHS system of assessment, planning and management of agricultural heritage landscapes and on tackling common current and future challenges.

The initiatives of the SDGs, European Green Deal and CAP at present clearly state the role of agricultural landscapes as units who possess (or ought to) the capability to support the change towards a socio-economically and ecologically viable future for planet Earth. It is these systems that have endured through time and space, the more traditional being amalgams of social, ecological, and economic actions and interactions. Heritage/cultural agro-landscapes can lead the way. Although they have been subject to systematic abuse for decades, the rise of the importance of traditional practices, small-scale farms, family businesses, mixed farming, agricultural landscape elements, and so on bring Agricultural Heritage Landscapes (AHLs) into the frontline. Still, the acknowledgement and creation of socio-ecological profiles and the realization of government schemes towards agricultural connections within those systems, such as linking traditional agricultural practices to the wider anthropogenic, ecological and recreational services, are in their infancy for many countries worldwide, including Greece. AHLs, managed appropriately, could dynamically help combat climate issues, continue to provide services of high value and also present local character, tradition and culture.

The present paper aims to identify AHLs and undertake an in-depth analysis taking into account three case studies within Greece, based on landscape character assessment, globally important agricultural heritage systems, and world heritage and cultural landscape criteria. The paper concludes with the development of strategic steps for their acknowledgement, conservation and management.

2. Materials and Methods

With the aim of identifying agricultural heritage landscapes and determining the strategic steps towards their acknowledgement, conservation and management characterization, this study has focused on analysis of the landscape as a dynamic system that develops based on the variable nature of human and natural procedures [20,21]. Therefore, the methodological framework on theories from the disciplines of geography, landscape architecture and landscape ecology have been considered.

Phase 1: Based on the methodology for Landscape Character Assessment (LCA), emphasis is given to the landscape characterization and judgment process, and in particular:

- Landscape character and guidelines
- Landscape quality and strategies
- Landscape value and designation
- Landscape sensitivity and capacity

Since LCA consists of the above processes, the criteria/strategic steps were grouped accordingly. Starting with the designation and conservation, the criteria were grouped, based on the Landscape: 1. Character and Morphology (form, scale, enclosure, texture, color, diversity, unity, balance, proposition), 2. Quality, 3. Value and 4. Capacity.

As such, the LCA methodology respects also this systematic approach of forms, functions, and values [22,23] since landscape quality, by terminology, includes the idea of function. According to Swanwick et al. (1999), “Landscape quality is based on judgements about the extent to which the distinctive character of a particular landscape character type

is visible in a specific area, and about the physical state or repair of the landscape or its visual and ecological integrity. (sometimes referred to as its function or condition)" [24]. Landscape value refers to "the relative value or importance attached to a landscape (often as a basis for designation or recognition), which expresses national or local consensus, because of its quality, special qualities including perceptual aspects such as scenic beauty, tranquility or wildness, cultural associations, or other conservation issues." [15].

Therefore, since the conservation of agricultural heritage systems includes both physical and biological components (i.e., local species and varieties, agricultural biodiversity, important ecosystem functions, ecological and cultural landscapes) and associated socio-cultural processes (i.e., cultural and value systems, knowledge and technology systems for agricultural production, bio-resources utilization, land and water resources management and environmental conservation), the current research included criteria from all the above.

Phase 2: A review of both the GIAHS criteria, focused mostly on the ones related to the landscape, and the World's Heritage List, focused on the ten selection criteria for a site of outstanding universal value, was implemented. The context of each GIAHS and UNESCO criteria was related to the LCA criteria/strategic steps and formed the basis of the proposed criteria for the acknowledgement and conservation of Agricultural Heritage Landscapes. As for the strategic steps regarding management, the current research was based on the principles and key stages for the management process as defined for the management of World Heritage Cultural Landscapes [25].

Phase 3: A comparative analysis among three case studies in Greece was performed to evaluate the criteria and strategic steps defined in both Phases 1 and 2. The case studies were selected based on their (a) value at the national level; (b) agricultural product and recognized landscape; (c) need for acknowledgement and protection; and (d) history and considered representativeness as AHLs. Therefore, the three case studies selected were (a) masticulture landscapes in Chios island, North Aegean region; (b) black (Corinthian) raisin vineyards in Aigialeia (Egialia), Achaia region, Peloponnese and (c) olive groves of Thassos island, Kavala region, Macedonia.

Hence, to achieve the objective of this study, twenty-six criteria formed the basis on which a comparative analysis was undertaken. Following, the strategic steps were derived based on the above criteria. Data collection for each case study was performed by the authors, through literature review, discussions with the local stakeholders and on-site visitations to assess the landscape character for each site. The literature review included the review of local books and leaflets on the history and cultivation of the species of the selected case studies. Local stakeholders constituted farmers and representatives of a potentially present association, who provided additional detailed information on the local cultivation practices and related traditions. During site visits, the landscape elements, features and patterns were recorded. Following, the authors altogether assessed the collected data based on the criteria defined. The results of the assessment are presented separately for each of the proposed criteria for acknowledgement and conservation of Agricultural Landscapes Heritage across all three sites

2.1. Case Study 1. Masticulture Landscapes in Chios Island, North Aegean Region

Geography: Masticulture is the cultivation of the endemic species *Pistacia lentiscus* (L.) var. *chia* (Duham), commonly known as mastic tree or schinos, for the produce of its aromatic resin (mastic). The produce of mastic is initiated by wounds induced on the main trunk and branches by the producers using sharp tools. The mastic tree grows exclusively in the southern region of the Greek island Chios, located NE of the Aegean Sea, approximately 3.5 km from the coast of Asia Minor (Figure 1). In particular, the mastic tree grows in the south of Chios below the line connecting the settlements of Lithi, Agios Georgios and Thymiana [26]. *Pistacia lentiscus* grows naturally in woodlands and scrub (broadleaved and coniferous forest, riparian and mountain forest and scrub, hedges, shady woodland margins) [27], and although it is found growing in the Mediterranean, Greece, and other regions of the island of Chios, it produces mastic only at this particular location. The

topography of the masticulture region is mainly semi-mountainous and, in some locations, lowland. Located within the mastic tree growing area is the Schinonas-Magiatico wildlife refuge (one of the seven wildlife refuges of Chios), covering 8,923,000 m² [28]. Generally, the climate is characterized as mild temperate-Mediterranean, with intermittent rainfalls in the summer and wet winters (Polunin, 1997) [29].

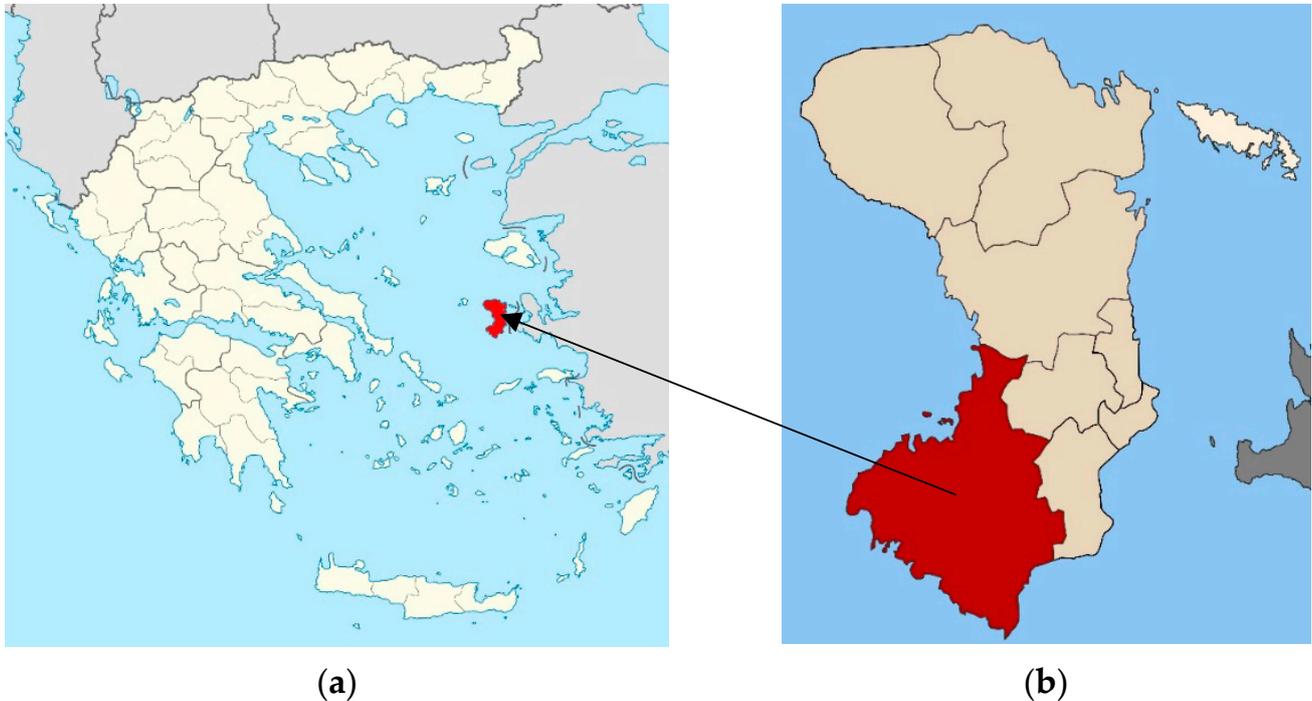


Figure 1. (a). Map of location of Chios island. Source: https://en.wikipedia.org/wiki/Chios#/media/File:Greece_location_map.svg, accessed on 24 February 2021 (modified by Paraskevopoulou), and (b) Mastihochoria area on Chios island. Source: https://en.wikipedia.org/wiki/Mastihochoria#/media/File:DE_Mastihochorion.svg, accessed on 24 February 2021 (modified by Paraskevopoulou).

History: The cultivation of mastic is dated to antiquity; Dioscorides, in his book titled “On Medical Material” dated 65 AD, states the medicinal properties of mastic. The exploitation of mastic cultivation led to the occupation of Chios island by the Genoese (1346–1566) and Ottomans (1566–1912) [30,31]. The cultivation of mastiha is associated with 24 traditional settlements known as Mastihohoria (Government Gazette of Hellenic Republic, ΦΕΚ 644B/1965; 594Δ/1978; 198Δ/1988; 1482/2001) [32], several of which are also protected as historical monuments by Greek law (Government Gazette of Hellenic Republic, ΦΕΚ 733B/1985; 49B/1996; 990B/1995; 49B/1998) [33] (Figure 2). Masticulture occupies a surface area of 211,687 km², with 4850 mastiha growers (European PDO products Precious Drops, n.d.) (Figure 3). The mastic is exported to 47 countries and used in the food, beverages, pharmaceutical, cosmetics and perfume industries. Since 1997, Chios mastiha has been identified as a Protected Designation of Origin (PDO) product of the European Union and has been registered in the Community List of PDO products. In 2014, UNESCO’s “Representative List of the Intangible Cultural Heritage of Humanity” included the “know-how of cultivating mastic on the island of Chios”.



Figure 2. Typical house facade at Pyrgi, a traditional settlement of Mastihohoria, Chios island, Greece. source: A. Paraskevopoulou.

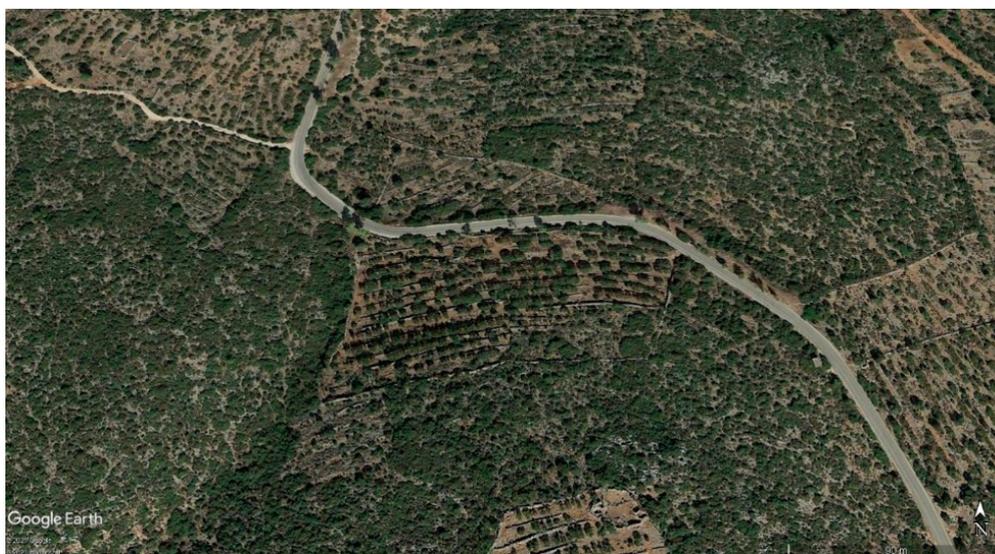


Figure 3. Aerial photo of masticulture (source: Google Earth, 2021).

Landscape: As already mentioned, *Pistacia lentiscus* (L.) var. *chia* (Duham) grows naturally in woodlands and scrub exclusively in the southern region of the Greek island Chios; therefore, the masticultures are integrated within the natural landscapes and not easily discernible at ground level (Figure 3). Masticultures are usually small-sized plots of mastic trees located on level ground in the valley along roads and close to the traditional settlements associated with its cultivation. The size of mastic trees (approximately 3 m tall) varies between plots depending on the tree age. Elderly mastic trees usually reach 4–5 m in

height. With the expertise of the mastic growers, the trunk of the mastic trees is ramified into 2–4 main branches, which branch further, forming a dense canopy. The historical traditional settlements that survived the major earthquake of 1881, such as Pyrgi, Mesta and Olympoi, have preserved the same architectural form since the Genoese occupation (1346–1566); this constitutes a tower located at the center of the settlement, an external wall formed with connecting houses that defined the settlement’s boundaries, and two iron gates that closed at sunset to defend against attacks [34].

Culture: Masticulture is a family occupation, with the cultivation, collection, and processing of mastiha following an annual cycle [25]. The average amount of resin produced per mastic tree is 100 g [35]. Every year, during January–February, the lower branches of the mastic trees are removed and the trees are fertilized. In June, the soil surface on which the mastiha will drop and be collected is prepared. Initially, the soil around the tree trunk is levelled and cleared of weeds and leaves. Following, the soil surface is swept using “frokalties” (i.e., brooms made from branches and leaves of plants such as weaver’s broom, thyme or the mastic tree) and then hand-spread with “asprohoma” (white earth containing calcium carbonate) (Figure 4). In mid-July, the “kentos” commences, which involves making small incisions on the trunk and main branches of the mastic tree using a sharp tool called a “kentistiri”. The mastic drips from the tree and gradually, after approximately 15–20 days, solidifies into a crystallized form [36]. The first mastiha harvest starts when the largest pieces of crystallized mastic drop, and takes place after the 15 August [36]. Following the first harvest, a second “kentos” and harvest is performed (mid-September—mid-October) [36]. The harvested mastic is washed either with seawater [25] or natural spring water [36], placed in wooden boxes and stored in a cool place. Elderly women in small groups carefully clean the mastic using sharp tools to remove any impurities [36,37] (Figure 5) and finally hand over the cleaned mastic to the Chios Mastiha Growers Association, where it will be sorted, classified and graded depending on the color and size of the mastic drops [38].



Figure 4. Mastic tree (*Pistacia lentiscus* var. *chia*) soil surface covered by “asprohoma” (source: E. Athanasiadou).



Figure 5. Elderly women cleaning the mastic (source: E. Athanasiadou).

Masticulture is performed by both men and women of all ages and the tasks have been divided between gender, for practical reasons: men prune, fertilize and prepare the soil surface before the incision of the mastic trees, while women extract the white earth and spread it on the soil surface, and harvest and clean the collected mastiha [25]. The oldest growers of both genders make incisions, while the younger growers observe the process to make incisions themselves under the supervision of the older growers [25]. This tradition is still passed down from one generation to the next, and it is continuing due to the efforts of the Chios Mastiha Growers Association. The Chios Mastiha Growers Association, founded in 1938 by the law 1390/1938, is lawfully the sole managing agent for Chios Mastiha and is responsible for ensuring the continuity of the methods for the cultivation of mastic [25]. The Chios Mastiha Growers Association own facilities to promote the production of mastiha that occupy 10,000 m² and involve the processing and packaging of variously sized mastiha drops (large, medium, small), the production of ELMA confectionary products (such as gum), the distillation of mastiha oil and preparation of traditional herbal medicinal products (powder and capsules).

2.2. Case Study 2. Black (Corinthian) Raisin Vineyards in Aigialeia (Egialia), Achaia Region, Peloponnese

Geography: The cultivation and production of the black raisin (*Vitis vinifera* L., var. Apyrena) developed at the municipality of Aigialeia in the eastern part of the Achaia regional unit, Peloponnese, Greece, (Figure 6) which occupies today an area of 723,063 km². The total area of black raisin cultivation in Greece is approximately 44,887,000 m² [37] and its annual production varies between 20,000 and 25,000 tn. During the period 1999–2012, there was a significant decline of annual production from 42,000 tn to 22,000 tn [37]. The most demanding markets of foreign countries are England, the Netherlands, France, Germany, the Scandinavian countries, U.S.A., Australia, and more. The vineyards of Aigialeia are among the most beautiful vineyards in Greece and among the very few that are similar to the ones in Samos, which have a north orientation and face the sea. Located in the mild northern slopes of the mountains Panahaiko, Klokos and Helmos, the vineyards receive the cool sea winds during the summer heat, and concomitantly, are protected against the warm humid south winds.

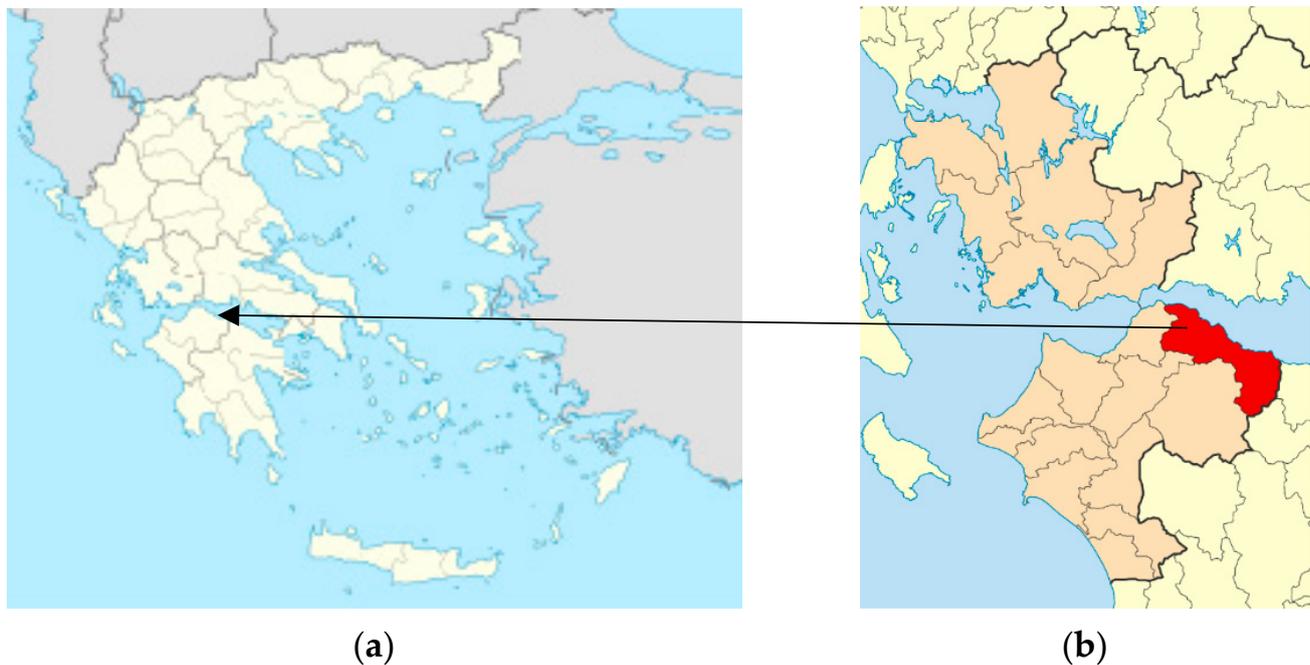


Figure 6. (a,b) Map of Aigialeia (source: <https://en.wikipedia.org/wiki/Aigialeia>, accessed on 1 January 2020).

Regarding the architecture, the neoclassical houses of the important raisin merchants of the past are spread out and indicate the wealth and flourish of those Peloponnesian cities during the period when the cultivation of the raisin was one of the most important activities.

History: The cultivation of the currant consists of a traditional practice that has been used since a long time ago, which leaves its mark upon the agricultural landscapes of the Peloponnese, Zakynthos and Cephalonia, areas where it is commonly cultivated. Phoenicians and Armenians were the ones who developed the trade of the dark raisin, first with the Greeks and later with the Romans. The black raisin was mentioned for the first time around 800 B.C., and more specifically, in Homer's Epics. Aristotle, Herodotus and Theocritus have made multiple references to the Corinthian raisin in their works. Xenophon mentions in his book "Anabasis" that the black raisin was included in soldiers' food [38].

The Franks were first to get involved in the organized trade of the Corinthian raisin, during the time they occupied the Peloponnese (1212 A.D.). Moreover, the Venetians (1389 A.D.) expanded the areas for raisin cultivation and developed its trade significantly. After the Ottoman Rule in Greece, Ioannis Kapodistrias (1830) re-established raisin cultivation in the area from Patras to Corinth [39]. Raisin exports in the 19th century (also referred to as "the gold century of the raisin") made up 70% of the country's total exports. The trade in Corinthian raisin was deeply affected by a huge crisis, which was the main reason for the socioeconomic agitations during the period of 1893–1900 [39]. The immigration phenomenon intensified after 1980, especially when the economy of the current was destroyed.

Landscape: The landscape of Aigialeia reflects a high heterogeneity of patches and landform (semi-mountainous and mountainous), with an altitude between 250 and 850 m, while the soil varies from white limestone to fertile sandy loam, but with good drainage. The landscape consists also of multiple canyons with rich vegetation and small streams that flow into the sea, which can be attributed to the area's mild climate. Extensive olive groves are mixed with the vineyards (Figure 7).



Figure 7. Several land uses forming Aigialeia’s landscape (source: Google Earth, 2021).

Culture: The black raisin from Aigialeia, known as *vostitsa*, has received a Protected Designation of Origin (PDO) [40], whose specifications include most of the traditional farming techniques used in the area. These techniques are mostly done by hand with the help of peaks or scissors, rake-brooms (*gravallo*), brooms (*saromatina*), and machines that separate the raisin from foreign materials and separate the different sizes of grapes (*makina*). Black raisin cultivation involves soil digging, pruning, tilling, preparation of the threshing floors, harvest (collection of grapes from the vines) and drying (Figure 8) [37]. The raisin cultivator’s family participates in all the works mentioned above, especially during the period after the harvest, when the cultivators need to live in small houses located inside the raisin fields, also known as “*lina*”. During the harvest period, the areas where “*lina*” are located, and the nearby villages as well, come to life. On top of that, during this time, many notable rituals and festivals take place, mostly regarding viticulture activities, such as the celebration of St. Trifonas in February, which concurs with the start of the vine harvest, as well as the celebration of the Metamorphosis of Christ, just before the raisin collection starts [39]. The raisin cultivation in the area has been playing a significant role in the daily life of the raisin-producing communities for centuries, while at the same time they have shaped the cultural landscape. The cultivation of the black raisin has been passed on from generation to generation, and it consists of an important aspect of sustainable development. Despite the decrease in the number of farmers, this tradition is ongoing, due to the efforts of the Farmer’s Union Vostizza. The “secrets” of the raisin cultivation are passed down to younger generations, either verbally or empirically, and the black (Corinthian) raisin has continued to leave its mark (architectural, cultural, developmental, social, gastronomical, and natural) for many centuries, in all the areas it is being cultivated [39].

Today, the Farmers Union Vostizza is the most active Raisin Cooperative Union in the area for promoting black raisin cultivation, supporting the agriculture production process and smallholders, and carrying out cultural and tourism activities, among other things. However, the difficulties and adversities that the producers have to face are numerous, and they can mostly be attributed to the continuous financial crisis, structural difficulties (small inheritance, high-cost procedure, etc.), as well as uncertainty about the future, which is intensified due to the huge competition of the product in the global market [37,39].



Figure 8. Spreading of the grapes and drying of the raisins under the sun, Zakynthos, 2014 (source: Aik. Gkoltsiou).

2.3. Case Study 3. The Olive Groves of Thassos Island, Kavala Region, Macedonia

Geography: There are no existing records of when olive culture began in Thassos, yet verbal records talk about trees existing since the antiquity. In the locations of Skala Rachoni and Skala Prinon, one can encounter olive trees more than 2000 years old [41]. The olive tree species cultivated in Thassos is *Olea europaea* var. *medio oblonga*, yet it is cited in many official documents as ‘Thasitiki’ [42,43]. Thassos is the northernmost island of Greece, situated in the Aegean sea, with a total area of 379 km² and a coastal perimeter of 95 km. (Figure 9). Ypsarion, a mountain spine, located centrally in an arch form, reaches an elevation of 1205 m [43]. Thassos has been given the name ‘the emerald island’ due to its pine forests (*Pinus brutia* and *Pinus halepensis*) starting from Ypsarion, reaching the vast olive groves, succeeded by the drought-tolerant grazed garigue and maquis, leading to the turquoise-colored sea (Figure 10). The evergreen foliage of the pines and the silver olives are interrupted by the vibrant spring blossoms of *Cercis siliquastrum* and *Cistus incanus*, creating an extensive pink carpet. The top of Ypsarion hosts firs and cedar trees, and in various parts of the island, junipers, chestnuts, birches, elms and sorbus are also found [43]. The forests subjected to the great fires of 1984, 1985, 1989 and 1993 have been largely destroyed, and this has been intensified with illegal grazing inhibiting, in some areas, the forests from reviving naturally.

History: The inhabitation of the island from the Paleolithic period onwards gave the people the opportunity to develop a close relationship with the land and the gifts it bore: gold, marble, timber, wine, olives and olive oil. However, written records of the Roman times state the presence of products other than olives [44,45]. Despite the presence of a strong relationship with Constantinople, for centuries during the Byzantine era (395–1453 A.D.), Thassos was subjected to several attacks by invaders and pirates. During the 13th–14th century, the island constantly changed hands among the Byzantines, Venetians and Genoese until the Ottoman invasion in 1456 that ended in 1912. Karidis and Kiel (2000), comparing the tax records of agricultural products for 1519, state that livestock and winemaking were responsible for 50% and 28% of the total tax income, respectively; honey and loulaki paint (from the plant *Indigofera tinctoria*) was responsible for 19%, while olive oil production was only 1.5% [46]. In the beginning of the 17th century, olive oil production was responsible for 60% of the tax income [46]. In 1670, of the total number of fruit trees (53,593) in Thassos, 48,776 were olive trees, accounting for 91% of the total number of fruit trees [46]. Currently, of the total cultivated land (62,611 m²) in Thassos, 62,585 m² is

occupied by olives, constituting 91% of the total cultivated land [47]. Therefore, one can conclude that olive cultivation has been the predominant agricultural activity in the island for more than 300 years.

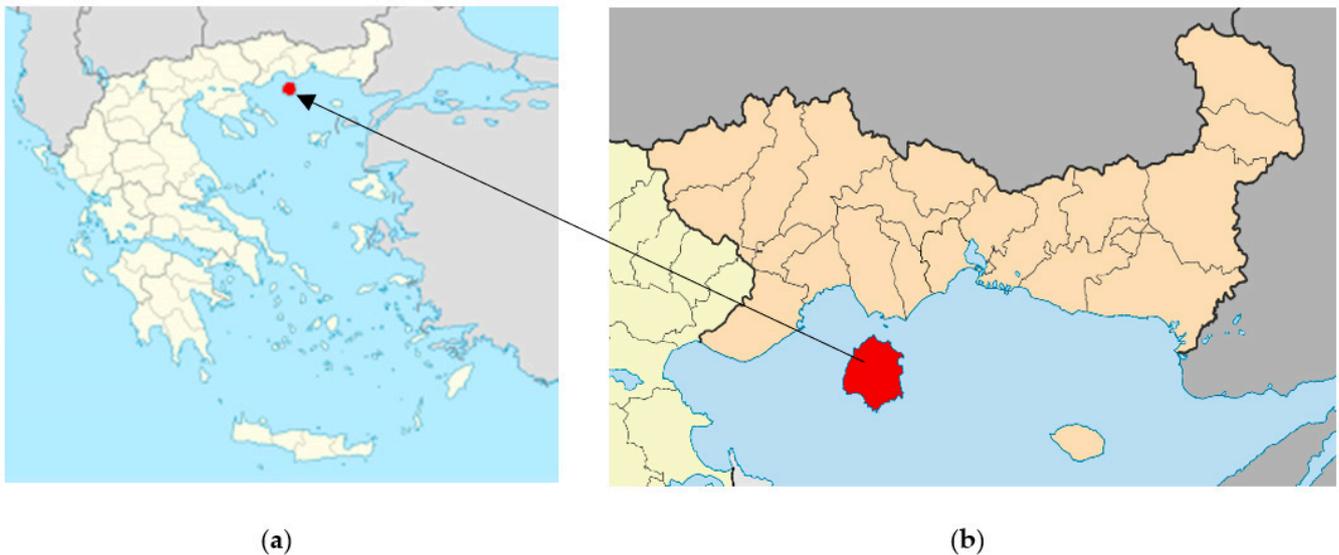


Figure 9. (a,b) Map of location of Thassos island (source: <https://en.wikipedia.org/wiki/Thasos>, accessed on 1 March 2021).



Figure 10. Olive groves with pine forests and human settlement, a very typical combination in Thassos island (source: E. Athanasiadou).

Landscape: In Thassos island, olive tree cultivation is an apparent tree monoculture occupying 16% of the total land. A large proportion of the Thassian olive trees are planted on the contours and are supported by dry-rock terraces [46]. Up to 30 years ago, due to the slope and spatial arrangement of the olive groves, each family had donkeys or mules to aid in olive husbandry, but nowadays, animals of these kinds are not found and have been replaced by 4 × 4 power-driven cars to minimize time spent in the fields, causing erosion and terrace destruction. A large scale research on the effect of several factors (biology-ecology, environmental conditions, etc.) on the control of the major olive pest, the olive fly *Bactrocera* (*Dacus*) *olea*, in Thassian olive groves from 1996 until 2004, granted by the Greek Ministry of Agriculture, revealed that the olive grove is a very complex system, supporting an abundance of entomological fauna [48–50].

Culture: Olive cultivation in Thassos island is part of the Thassians' identity, and combined with tourism is the main source of income for the inhabitants [51]. The cultivation of the olive is a supplement to the family income, since all families hold olive trees [52]. However, the high tourism development of the island and the lack of an association of farmers based in Thassos might cause serious problems for the future of olive groves and their succession to the next generations. Thassos island holds 1,008,415 million trees and an annual produce of 82 tn table olives and 11,103 tn of olive oil. The olive oil extracted from the trees of the island has been accredited as a product of Protected Geographical Indication (PGI) under the name of 'Thassos' [50,51].

Conventional cultivation methods of olive culture are not intensive and are without detrimental effects to the environment, and organic olive culture is not very much different in practice, yet it occurs in very small numbers. Sfakiotakis (2001) [51] suggests that conventional olive culture can easily convert to an integrated management or organic agriculture scheme. Cultivation of the olive tree consists annually of the following practices: (a) pruning (February–March); (b) pest management (May–September); (c) mulching (October); and (d) olive collection (November–December). Furthermore, the small-scale farm combined with transhumance and goat-sheep grazing provides a mixed system ideal for high-elevation and semi-mountainous areas, the livestock providing via manure, fertilization of the soil and weed control [52].

Several decades ago (30–40 years), the collection of the olives during November and December was a seasonable fulltime task, involving families and friends harvesting the groves, and also managing landscape elements like the stone terraces. These two autumn months of collection in the olive groves was part of the cultural identity, people gathered to work, but also to cook, sing, exchange news and tell stories. The whole procedure aided the strengthening of social bonding. Although the 'fast society' of the 21st century does not allow such 'luxuries', people still get together and create a social event and element of culture out of olive collection, rather than just focusing on quantifiable economical parameters like yield and profit (Figure 11).



Figure 11. Woman collecting olives at the period of harvest. (source: E. Athanasiadou).

3. Results—Discussion

LCA constitutes a series of steps that includes the process of landscape characterization and subsequent making of judgements (landscape quality) and value assessment (landscape value) [53,54]; each of the individual criteria applied by FAO [55] and UNESCO [25] for the identification of GIAHS and World Heritage Cultural Landscapes, respectively, as well as their definitions were associated to the related LCA steps for terrestrial landscapes

(not seascapes) and combined together to form the proposed criteria for the acknowledgment and conservation of Agricultural Heritage Landscapes (Table 1).

More specifically, GIAHS identification includes the following 5 criteria [55]: i. food and livelihood security (i.e., the manner in which the agricultural system contributes to the food and/or livelihood security of the local community); ii. biodiversity and ecosystem function (i.e., the agrobiodiversity and ecological function of the agricultural system); iii. knowledge systems and adapted technologies (i.e., the traditional knowledge, ingenious adaptive technology, and management systems of natural resources related to the agricultural system); iv. cultures, value systems and social organizations (i.e., the cultural practices, collective value systems such as customs, communal rules and agreements for decision-making processes related to access and use of natural resources, and social organizations associated with the management of resources and food production of the agricultural system); v. remarkable landscapes, land and water resources management features (i.e., the agricultural system's landscape and seascape features developed by the co-adaptation of the rural community with its environment).

Amongst the three types of cultural landscapes identified by the World Heritage Committee, agricultural landscapes are described in the second category of "Organically Evolved Landscapes" and sometimes the third category of "Associative Cultural Landscapes" [25]. In relation to UNESCO's 10 criteria for World Heritage Cultural Landscapes identification, it is necessary that sites meet at least one of the following cultural (i., ii., iii., iv., v., vi.) or natural (viii., ix., vii., x.) criteria [25]: i. to represent a masterpiece of human creative genius; ii. to exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design; iii. to bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared; iv. to be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history; v. to be an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change; vi. to be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance (the committee considers that this criterion should preferably be used in conjunction with other criteria); vii. to contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance; viii. to be outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features; ix. to be outstanding examples representing significant ongoing ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals; x. to contain the most important and significant natural habitats for in situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation. Based on the analysis undertaken of the LCA steps and FAO's and UNESCO's criteria, this paper has reached the proposed list of criteria for the acknowledgment and conservation of Agricultural Heritage Landscapes shown in Table 1, and the list of criteria for the management of Agricultural Heritage Landscapes shown in Table 2.

Considering the proposed criteria across the three case studies presented, the paper concludes with strategic steps for the acknowledgment, conservation and management of Agricultural Heritage Landscapes, in relation to the LCA, GIAHS and UNESCO criteria summarized in Tables 3 and 4.

Table 1. Proposed criteria for the acknowledgement and conservation of Agricultural Heritage Landscapes generated by the combined interrelation of LCA, GIAHS and World Heritage Cultural Landscapes criteria (sources: The Countryside Agency and Scottish Natural Heritage, 2002 [3]; LI/IEMA, 2005, 2013 [54]; FAO, 2021 [55]; UNESCO, 2019 [25]).

Landscape Character Assessment Steps (The Countryside Agency and Scottish Natural Heritage, 2002; LI/IEMA, 2013)	Proposed Criteria for Acknowledgement and Conservation of Agricultural Heritage Landscapes	GIAHS Designation Criteria by FAO (FAO, 2021)	World Heritage Cultural Landscapes Categories and Criteria by UNESCO (UNESCO, 2019)
Landscape character (Characterization): <i>"A distinct, recognizable, and consistent pattern of elements in the landscape that makes one landscape different from another, rather than better or worse."</i>			
	i. Aesthetically remarkable agricultural landscapes of exceptional aesthetic beauty and importance.	<i>"Remarkable landscapes, land and water resources management features."</i>	<i>"to contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance."</i>
Morphology: Form, Scale, Enclosure, Texture, Colour, diversity, Unity, Balance, Proportion.	ii. The morphological characteristics (form, shape) of landscapes and/or seascapes and their interlinkages are characterized by long historical persistence, representative culture and a strong connection with the local socio-economic systems that produced them.	-	<i>"to be an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change."</i>
	iii. Diversity of spatial structure of agricultural plots	<i>"Biodiversity and ecosystem function."</i>	-
	iv. Agricultural Infrastructure and settlements contribute to the spatial pattern of the landscape and illustrate a significant stage in national or global history.	<i>"Remarkable landscapes, land and water resource management features."</i>	<i>"to be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history."</i>
Landscape character (judgement): <i>a. Landscape quality, b. Landscape value</i>			
	v. Dynamically evolved landscapes. The process of evolution is reflected in the form and elements and features. The condition of the landscape features and elements might be poor/declining/good.	<i>"Globally Important Agricultural Heritage Systems (GIAHS) are outstanding landscapes of aesthetic beauty that combine agricultural biodiversity, resilient ecosystems and a valuable cultural heritage."</i>	<p><i>"Cultural Landscapes category (ii): is the organically evolved landscape. This results from an initial social, economic, administrative, and/or religious imperative and has developed its present form by association with and in response to its natural environment. Such landscapes reflect that process of evolution in their form and component features."</i></p> <p><i>"They fall into two sub-categories:</i></p> <ul style="list-style-type: none"> <i>- a relict (or fossil) landscape is one in which an evolutionary process came to an end at some time in the past, either abruptly or over a period. Its significant distinguishing features are, however, still visible in material form.</i> <i>- a continuing landscape is one which retains an active social role in contemporary society closely associated with the traditional way of life, and in which the evolutionary process is still in progress. At the same time, it exhibits significant material evidence of its evolution over time."</i>

Table 1. Cont.

Landscape Character Assessment Steps (The Countryside Agency and Scottish Natural Heritage, 2002; LI/IEMA, 2013)	Proposed Criteria for Acknowledgement and Conservation of Agricultural Heritage Landscapes	GIAHS Designation Criteria by FAO (FAO, 2021)	World Heritage Cultural Landscapes Categories and Criteria by UNESCO (UNESCO, 2019)
a. Landscape quality (condition) is based on judgements about the extent to which the distinctive character of a particular landscape character type is visible in a specific area, and about the physical state or repair of the landscape or its visual and ecological integrity (sometimes referred to as its function or condition)."	vi. Landscapes shaped by unique, traditional distinctive agriculture and farming methods (in relation to the effective use of natural resources, adapted to the local environmental conditions) representative of a culture, which still contribute to the local economy.	"Food and livelihood security."	"Cultural Landscapes category (iii): is the associative cultural landscape. The inclusion of such landscapes on the World Heritage List is justifiable by virtue of the powerful religious, artistic or cultural associations of the natural element rather than material cultural evidence, which may be insignificant or even absent".
	vii. Agricultural plots part of a diverse land use system.	"Biodiversity and ecosystem function."	-
	viii. Agricultural landscapes with significant ecosystem services.	"Biodiversity and ecosystem function."	"to be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals."
	ix. Landscapes valued as a resource because they are rare.	"Remarkable landscapes, land and water resources and management features."	"to bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared."
	x. Landscapes reflecting a particular cultural identity.	"Cultures, value systems, and social organizations."	"to bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared."
	xi. To be acknowledged by the public about their importance.	"Cultures, value systems, and social organizations."	"to be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance."
	xii. To be associated with invaluable local and traditional knowledge, ingenious adaptive technology, local traditional, cultural, spiritual, religious and social initiatives (e.g., agricultural events, festivals) and traditional management systems of natural resources.	"Knowledge system and adapted technology."	"to represent a masterpiece of human creative genius"
	xiii. Presence of social organisations for the transfer of agricultural culture, implementation of educational activities and practices, institutions to share and transfer knowledge and technology.	"Cultures, value systems, and social organizations."	"to bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared."

Table 1. Cont.

Landscape Character Assessment Steps (The Countryside Agency and Scottish Natural Heritage, 2002; LI/IEMA, 2013)	Proposed Criteria for Acknowledgement and Conservation of Agricultural Heritage Landscapes	GIAHS Designation Criteria by FAO (FAO, 2021)	World Heritage Cultural Landscapes Categories and Criteria by UNESCO (UNESCO, 2019)
b. Landscape value (scenic beauty, rarity, representativeness, wilderness, tranquillity, existence of a consensus, associations with particular people, events in history). <i>“The relative value or importance attached to a landscape (often as a basis for designation or recognition), which expresses national or local consensus, because of its quality, special qualities including perceptual aspects such as scenic beauty, tranquillity or wildness, cultural associations or other conservation issues.”</i>	xiv. To contain significant features of wildlife, earth science or archaeological or historic interest for in situ conservation.	<i>“Biodiversity and ecosystem function.”</i>	<i>“to contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation.”</i> <i>“to be outstanding examples representing major stages of earth’s history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features.”</i>
	xv. Remarkable landscapes under dynamic conservation	<i>“Remarkable landscapes, land and water resources management features.”</i>	<i>“to contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation.”</i>
	xvi. Globally significant biodiversity and genetic resources for food and agriculture and their importance for conservation	<i>“Biodiversity and ecosystem function.”</i>	<i>“to be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals.”</i>

The proposed criteria for the management of Agricultural Landscapes Heritage were based on the work of Yiu & Takeuchi (2016) [56]; and further developed in order to respond holistically to the management of these particular sites. This is why emphasis was also given to socio-economic aspects. For a better organization of the management criteria, four categories were proposed (landscape aspect, social aspect, legal aspect, economic aspect).

Table 2. Proposed criteria for the management of Agricultural Heritage Landscapes in relation to GIAHS and World Heritage Cultural Landscapes criteria.

Category	Proposed Criteria for Management of Agricultural Landscapes Heritage	GIAHS Designation Criteria by FAO	World Heritage Cultural Landscapes Categories and Criteria by UNESCO
Landscape aspect: Resilience against change	xvii. The values of agricultural landscape heritage are retained, through a balance between people and the environment.	<i>"Cultures, values systems, and social organizations."</i>	<i>"to exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design."</i>
	xviii. Capable of recovering from natural disasters and changes in ecosystems of local traditional systems	-	-
	xix. Mechanisms/networks that ensure that the agricultural landscape heritage is reliably inherited by future generations.	<i>"Cultures, value systems, and social organizations."</i>	-
Social aspect: Involvement of primary/key stakeholders	xx. Governance through dialogue and agreement among key stakeholders.	<i>"Cultures, value systems, and social organizations."</i>	-
	xxi. Participation of various local stakeholders and development of a shared vision for the future.	<i>"Knowledge system and adapted technology."</i>	-
	xxii. In place initiatives to facilitate public participation.	<i>"Cultures, value systems, and social organizations."</i>	-
Legal aspect	xxiii. Laws support the maintenance of the territory potentialities and protection of landscape quality.	-	-
Economic aspect	xxiv. Development of alternative forms of tourism (e.g., agrotourism).	<i>"Remarkable landscapes, land and water resources management features."</i>	-
	xxv. Create a brand name for the agricultural landscape and products.	GIAHS designated agricultural systems	-
	xxvi. Promotion of new business model associated with the Agricultural Heritage Landscapes.	-	-

Where "-", no criterion for this category.

Table 3. Comparative analysis of the criteria/strategic steps for acknowledgement and conservation, for the (3) case studies.

Proposed Criteria for Acknowledgement and Conservation of Agricultural Landscapes Heritage	Black (Corinthian) Raisin Vineyards in Aigialeia	Masticulture in Chios	Olive Groves in Thassos
i. Aesthetically remarkable agricultural landscapes of exceptional aesthetic beauty and importance.	- ¹	-	-
ii. The morphological characteristics (form, shape) of landscapes and/or seascapes and their interlinkages are characterized by long historical persistence, representative culture and a strong connection with the local socio-economic systems that produced them.	-	X	X
iii. Diversity of spatial structure of agricultural plots	X	X	-
iv. Agricultural infrastructure and settlements contribute to the spatial pattern of the landscape and illustrate a significant stage in national or global history.	-	X	X
v. Dynamically evolved landscapes. The process of evolution is reflected in the form and elements and features. The condition of landscape features and elements might be poor/declining/good.	X	-	X
vi. Landscapes shaped by unique, traditional distinctive agriculture and farming methods (in relation to the effective use of natural resources, adapted to the local environmental conditions) representative of a culture, which still contribute to the local economy	X	X	X
vii. Agricultural plots part of a diverse land-use system	X	X	-
viii. Agricultural landscapes with significant ecosystem services	X	X	X
ix. Landscapes valued as a resource because they are rare	-	X	-
x. Landscapes reflecting a particular cultural identity	X	X	X
xi. To be acknowledged by the public about their importance	X	X	X
xii. To be associated with invaluable local and traditional knowledge, ingenious adaptive technology, local traditional, cultural, spiritual, religious and social initiatives (e.g., agricultural events, festivals) and traditional management systems of natural resources.	X	X	X
xiii. Presence of social organisations for the transfer of agricultural culture, implementation of educational activities and practices, institutions to share and transfer knowledge and technology	X	X	-
xiv. To contain significant features of wildlife, earth science or archaeological or historic interest for in—situ conservation.	X	X	X
xv. Remarkable landscapes under dynamic conservation	-	-	-
xvi. Globally significant biodiversity and genetic resources for food and agriculture and their importance for conservation	X	X	X

¹ Where “-” no documentation.

Table 4. Comparative analysis of the criteria/strategic steps for management of the (3) case studies (based on the work of Yiu & Takeuchi, 2016 [56]).

Proposed Criteria for Management of Agricultural Landscapes Heritage	Black (Corinthian) Raisin Vineyards in Aigialeia	Masticulture in Chios	Olive Trees in Thassos
xvii. The values of agricultural landscape heritage are retained, through a balance between people and the environment.	X	X	X
xviii. Capable of recovering from natural disasters and changes in ecosystems of local traditional systems	- ¹	X	X
xix. Mechanisms/networks that ensure that the agricultural landscape heritage is reliably inherited by future generations	X	X	X
xx. Governance through dialogue and agreement among key stakeholders	-	X	X
xxi. Participation of various local stakeholders and development of a shared vision for the future	X	X	X
xxii. In place initiatives to facilitate public participation	-	-	-
xxiii. Laws support the maintenance of the territory potentialities and protection of landscape quality	-	-	-
xxiv. Development of alternative forms of tourism (e.g., agrotourism)	-	-	-
xxv. Brand name for the agricultural landscape and products	X	X	X
xxvi. Promotion of new business model associated with the Agricultural Heritage Landscapes	-	-	-

¹ Where “-”, no documentation.

Based on Tables 3 and 4, all three case studies (masticulture landscapes in Chios island, black (Corinthian) raisin vineyards in Aigialeia (Egialia), and olive groves in Thassos island) are supported by remarkable landscapes. These landscapes are considered remarkable due to their particular valuable characteristics, such as the pattern (e.g., settlement pattern of masticulture landscapes) and structure generated by the diversity of agricultural plots and hosted human activities, which are reflected in the development of these cultural landscapes (vi., x, xii), and the significant existing ecosystem services and biodiversity (viii, xiv, xv). However, the two tree cultures, the olive trees of Thassos and the mastic trees of Chios, are the ones which present a unique and clearer structure and exceptional natural beauty. The endemic nature and unique structure of the mastic trees of Chios have developed a particular landscape character that is integrated within the natural landscape and not easily discernable; thus, this landscape is declared by the Greek state as agricultural land of national importance [57]. Yet, the vineyards of black raisin in Aigialeia present remarkable agricultural diversity (aesthetically and functionally) due to the geomorphology and union with other agricultural systems (olive groves) and natural vegetation (maquis and pine forests). However, mostly in Thassos, the terraces and stone walls are the most predominant elements of landscape structure. On the other hand, some of the closely associated masticulture settlements constitute or possess historical monuments; the historical settlements of Mesta and Pyrgi in particular are registered as areas of outstanding natural beauty in the database Filotis developed with the National Technical University of Athens (codes AT5011037 and AT5011038, respectively). For all three case studies, morphological characteristics are linked with long historical and cultural testimonies [30,31,38,44,45]. Regarding the case of vineyards of black (Corinthian) raisin in Aigialeia (Egialia), the ephemeral landscape created (during the period of drying the raisins) is strongly interconnected with people's history and culture [38,39].

Although the above depict a respect of the local community towards their landscape and tradition, economic pressures seem to define the existence of these cultivations [37]. Therefore, cultivations of raisins and olive trees are prone to abandonment or replacement by other cultivations/land uses. Whereas, in Chios, where the Chios Mastiha Growers Association is highly active, the landscape is evolving, due to legislative protection, despite the occurrence of disastrous events such as the wildfires in 2012 that burnt approximately 53% of the total yield [34,58]. Mastiha culture also seems to hold a stronger 'cultural heritage' value in the minds of not just growers and local people, but also other stakeholders involved (tourists, consumers), creating a more rigid framework for its protection and enhancement. Olive trees may be more than 1000 years old in Thassos island, yet without any 'cultural marking' attached to them, they are prone to alterations and even destruction.

Regarding the cultural aspect and value, all three case studies are shaped by unique traditional farming methods representative of their civilization, reflecting a particular cultural identity and acknowledged by the locals [26,39,51]. This is also justified by the (xii) criterion, as these landscapes are associated with many festivals and traditional management systems. Despite that, an expected modernization occurs especially on the standardization and promotion of the product. However, the recognition of rarity is basically acknowledged only for the mastic trees in Chios, since it is endemic to Greece and worldwide. For the other two case studies, at a national level, there are more locations here that are cultivated. In a broader, global context, these landscapes are also rare, because their products, olive oil, olives and raisins, are trending towards extinction, and as a result, so is their landscape use and value. Of all three, the raisin culture seems to be 'invisible' in terms of public awareness, and this results also in the absence of a strong identity profile. Thus, there is an imperative need for steps toward its protection and enhancement.

Regarding biodiversity and ecosystem function and services, all three case studies have globally significant biodiversity and genetic resources that are important to be conserved and significant features of wildlife or elements of archaeological/historic interest [28,39,43,49,50]. It is encouraging that in the cases of masticulture and raisin production, there are social organizations—associations of producers—to transfer knowledge

and technology. A strong organization-association may not exist in Thassos island to support the olive culture's importance as 'cultural heritage', maybe due to the fact that it has always been part of the people's working activities, and they have never considered that it could be 'endangered' and thus, that it has to be acknowledged and protected. Finally, none of the three case studies absolutely fulfill criterion (xv), "remarkable landscapes under dynamic conservation", due to lack of data evidence.

All case studies fulfill several of the proposed criteria for acknowledgement and conservation: masticulture in Chios island (nine criteria), black (Corinthian) raisin vineyards in Aigialeia (Egialia) (twelve criteria), and olive groves of Thassos island (nine criteria).

Regarding the criteria and future steps for management of the three case studies (masticulture landscapes in Chios island, black (Corinthian) raisin vineyards in Aigialeia (Egialia), and olive groves of Thassos island), the values of agricultural landscape heritage are retained through a balance between people and the environment, varying in degree (from the lowest to the highest), depending on the adjacent land uses and economic sectors (tourism, urbanization, forest expansion, etc.). However, these types of landscapes seem to present difficulties in recovering from natural disasters. In all of them, there are networks and local stakeholders, as well as governmental willingness to support them and develop a shared vision for the future [26,39]. Furthermore, in all of them, the Ministry of Rural Development and Food is making serious steps towards the protection of the product, but it is not well known if there are steps towards the appropriate management of their landscape and its cultural value. From the above comparative analysis, there seems to be a lack of a business plan (i.e., brand name of Globally Important Agricultural Heritage Systems, and business model associated with the Agricultural Heritage Landscapes). Therefore, there is a strong need for strategic steps towards their management, counting on the above criteria.

The proposed criteria and comparative analysis of the selected three case studies help towards the development of a series of strategic steps for the case studies presented, as well as for any potential agricultural landscapes which will claim to be AHLs. The fulfillment of (all or some) of the suggested criteria for acknowledgment, conservation and management are basically the strategic steps that should be followed for any AHL heritage landscape designation.

More specifically, for the selected case studies the following are suggested:

Masticulture landscapes in Chios. It is considered necessary to:

- Adopt a holistic approach in safeguarding the landscape that is interrelated with the masticulture and has been formed by it, rather than safeguarding individual elements or aspects of masticulture (as has been the practice to date).
- Safeguard and support at a global scale the ALH value and the masticulture as a 'system' with great ecological and social benefits, ecosystem services and tradition identity.
- Encourage the research, conservation and promotion of the history and culture associated with the masticulture.
- Highlight the benefits of masticulture in supporting sustainable agriculture and rural development of local communities and the opportunities for supporting agrotourism, cultural and gastronomic tourism while concomitantly protecting both the masticulture landscape and heritage.

Black (Corinthian) Raisin Vineyards in Aigialeia. It is considered necessary to:

- Include the cultivation of black raisin of Aigialeia in the Intangible Cultural Heritage of Greece.
- Encourage the research, conservation and promotion of the history and culture of the Corinthian raisin and its traditional cultivation methods.
- Expand raisin cultivation and disseminate the value of raisin consumption in the national and international market.
- Highlight the opportunities from raisin cultivation for the development of sustainable and multifaceted local communities by stimulating agrotourism and cultural and gastronomic tourism.

- Support the organized global campaign for the promotion of the black currant as a Greek superfood and as an important element of the Mediterranean Diet, which is already registered in the Unesco's Representative List of the Intangible Cultural Heritage of Humanity [38].
- Safeguard and support at a global scale the ALH value and the black (Corinthian) raisin cultivation as a 'system' with great ecological and social benefits, ecosystem services and tradition identity

Olive Groves in Thasos. It is considered necessary to:

- Focus on the 'system' and not the 'produce' and create a marketable 'identity' which emphasizes the uniqueness, originality, and locality of olive culture in Thasos island and its related landscape of great ecological and system services value.
- Support multifunctionality of farms, connect them to agro-tourism schemes, agro-forestry schemes and the wider natural and man-made landscape; increase visibility by education and connection of different stakeholders involved.
- Assist marketing and branding techniques to support 'heritage', 'organic', 'holistic', 'agroecosystem', 'land ethics', and so on, certifications.
- Assist integrated pest management methods and promote organic cultivation.
- Educate/train farmers and all stakeholders involved, especially pupils and tourists, on Globally Important Agricultural Heritage Systems, and climate-change-mitigation techniques.
- Recognize 'threats' (e.g., tourism, climate change, change of socio-economic profile) and cultivation methods to tackle them.
- Link transhumance and sheep- and goat-caring systems to the olive grove landscapes and brand them as a 'system'.
- Plan for the future, predict climate change and tourism impact on the model and suggest means of adjustable transformation.

4. Conclusions

In this paper, an attempt has been made to compose a framework of criteria and therefore strategic steps for the acknowledgement, conservation and management of AHLs. A comparison among three potential case studies in Greece has been made to test the implementation of the proposed criteria and to identify specific strategic steps. At the same time, with regards to their respective designation criteria, commonalities can be seen.

The landscape associated with masticulture is unique due to the endemic nature of the mastic tree and has been defined by this. Several conquerors (Venetians, Genoese and Ottomans) contested to control and manage the cultivation of mastiha. The historical settlements associated with masticulture were developed in such a way to protect against attacks. Masticulture and the regionally distinct product "mastiha", found worldwide and produced only in Chios, are protected by legislation; this, in addition to mastiha's medicinal and aromatic properties, constitutes a good source of income for growers that continue its cultivation following traditional practices. This case study is a good example exhibiting how the proposed criteria for acknowledgement and conservation of AHLs set the framework for its management. Although the masticulture area known as Mastihoxoria is defined, there are no statutory measures addressing the protection of the masticulture landscape as a whole. There is a need to integrate the separate aspects of masticulture that are designated (i.e., settlements, buildings, species) into the landscape that shaped them; these aspects are interrelated and would not exist without the species *Pistacia lentiscus* (L.) var. chia (Duham), a feature of the natural landscape existing since antiquity.

Aigialeia's landscape is one of the most beautiful agricultural landscapes in Greece, consisting of a mixture of vineyards, olive groves and natural features (canyons, rich vegetation, streams). The cultivation of the currant consists of a traditional practice that has been used since a long time ago, which leaves its mark upon the agricultural landscape. The traditional black raisin cultivation in the area has played a significant role in the daily life of the raisin-producing communities for centuries, while at the same time shaping

the cultural landscape. It is a remarkable agricultural landscape, evolving and reflecting a particular cultural identity. Regardless of the difficulties that the producers have to face (e.g., financial crisis, structural difficulties, uncertainty for the future, competition of the product in the global market), a balance between people and the environment is still maintained.

Thassos olive grove landscapes are the result of the relationship between man, nature, and the practice of agriculture and livestock management, with the olive tree culture being a strong component in the inhabitants' annual calendar of actions, thus creating an intangible and tangible cultural heritage. Although in the last 60 years, there has been a decrease in interaction of the people with the natural land and its full utilization due to the increase of tourism, olive cultivation remains an active, profitable family business, connecting people to the landscape. Yet, tourism seems to be the major thread for the conversion of land and alteration of this old and traditional complex landscape, and olive culture is under threat.

Despite the above, for all the case studies, there is a need for a prolific dialogue and agreement among government and key stakeholders, as well as a constructive management plan to create initiatives to facilitate public participation, to create a brand name for the agricultural landscapes and products and to promote new business models associated with the AHLs. The proposed criteria encompass the AHLs as holistic systems, resulting from the action and interaction of natural and/or human factors. They occur from a detailed review and analysis of the terms 'landscape', 'agriculture', and 'heritage', and from existing frameworks of criteria, such as LCA, GIAHS and UNESCO. The proposed criteria refer to a landscape's natural and cultural factors, morphological and functional aspects, and values, referring to biodiversity and ecosystem services, land, and water resource management features, to aesthetic beauty, to sustainable use of food, to culture, values, systems and social organisations, to traditional agricultural practices, related rules and regulations, and to religious rituals, customs, and habits. In relation to CAP's nine criteria, the proposed criteria and strategic steps will help move towards a fair income for farmers, increase competitiveness for agricultural productivity in a sustainable way, contribute to climate change mitigation and adaptation, foster efficient management of natural resources, preserve landscapes and biodiversity, and protect food and health quality. The approach to strategic steps for management is related to the values and characteristics of cultural landscapes, associating people with the cultural landscape, enhancing the dialogue and agreement among key stakeholders, promoting the interaction between people and their environment, and retaining the values of the cultural landscape. AHLs, as defined by the proposed criteria framework, respect the 17 goals of the UN, for sustainable agriculture, consumption and production patterns, and protection of terrestrial ecosystems, and prevention of biodiversity loss. Therefore, the conservation of agricultural heritage landscapes must be conducted in a dynamic way so that local farmers can benefit from the continuance of the traditional agricultural production while the heritage site can seek development under the premise of ecological functions being conserved and traditional culture being inherited [59]. Cultural elements should be treated the same as ecological ones like biodiversity and ecological functions, and be preserved with them as an entity in a dynamic way. However, the framework of criteria needs to be tested in more potential case studies in Greece and abroad, and to be adjusted accordingly. The difficulties are to persuade and sensitize people to proceed with the traditional agricultural methods, which do not necessarily contradict modern agriculture. Future research could focus on relating the criteria and strategic steps with related existing policies on agricultural landscapes and heritage, as well as on helping with the formation of new ones, particularly ones adapted for the protection, design and management of agriculture heritage landscapes.

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